# Investigation of Speckled Dace Spawning Behavior

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## INTRODUCTION

Speckled dace is closely related to loach minnow and exhibits similarities in egg deposition during spawning (Childs 1998). Research on captive breeding of speckled dace, indicates that spawning in artificial aquaria can be elicited by manipulation of water temperature and photoperiod to mimic conditions associated with natural spawning of wild fish. The goal of this study was to induce spawning behavior during Fall 2004 through environmental manipulation, and to observe and describe this behavior. In addition, if possible, spawning behavior was to be captured on video.

## METHODS

All reproductive work on speckled dace was carried out in a wetlab at Bubbling Ponds Hatchery near Cornville, Arizona, that is isolated from surrounding bodies of water. Water for the lab is supplied by an artesian well (18.6 C, 110 ppm CaCO3, pH 7.6), and all tanks and aquaria are recirculating systems (not flow-through). Both circular tanks and linear raceways were used during this study. Photoperiod was set to approximate an April photoperiod (12.5 h L : 11.5 h D), and water temperature was held at a constant 21 C by ambient room temperature.

Speckled dace (N=20) were collected on October 6, 2004 from a pond at Page Springs Hatchery. Dace enter the pond from nearby Oak Creek through a large drain pipe, and have become established within the pond. Fish were collected using two minnow traps baited with bread and trout chow. The traps were fished overnight and twenty fish were randomly selected for transport to the laboratory. Prophylactic treatments using malachite green were administered on October 6, 7, and 8 to control possible outbreaks of Ich. Water in the tanks was replaced between treatments using artesian well water. Fish were fed *ad libitum*, once each day with freeze-dried bloodworms, and Tetramin® flake food. Both foods were obtained through Aquatic Ecosystems, Apopka, FL.

On October 8, all speckled dace were moved to a linear raceway with a steady flow velocity of 10 cm/sec. Four small cobbles (5-10 cm diameter) and four clay potsherds were placed in the raceway, and the bottom substrate consisted of commercial pea gravel. Similar cobble had been used successfully as spawning substrate with loach minnow

(Childs 2004). Spawning cobbles were picked up individually, turned over and inspected for presence of eggs, at approximately 0900 h each day. Filming of spawning behavior was to be initiated upon finding spawned eggs in the raceway.

On January 3, 2005, all dace were moved to a circular fiberglass tank in the laboratory. The bottom of the tank was bare fiberglass, and four spawning cobbles were placed in the tank around the outer edge, where current velocity was highest (10 cm/sec). Several clay potsherds were also placed in the tank, for cover. Current was maintained in the tank by directing inflow from the recirculating system to force water in a circular direction (clockwise) around the tank. If fatigued, fish could use the spawning cobbles to deflect some of the current, hide under the clay potsherds, or move to the center of the tank, where flow velocities were lower. Again, spawning cobbles were picked up individually, turned over and inspected for presence of eggs, at approximately 0900 h each day. This procedure was continued until March 25, 2005, when daily observations were discontinued.

## RESULTS

None of the speckled dace showed breeding coloration at time of collection, and none ever developed breeding coloration in the laboratory. This was a surprising result, given previous success inducing secondary sexual development in the species (Childs 1998). Since no breeding coloration was ever observed, it is possible that all 20 collected dace were females, which show far less breeding coloration than males.

No evidence of reproduction (presence of eggs) was ever recorded during the study. This could also be explained by the possibility that all collected dace were female. Since eggs were never found, dace were not filmed during the study, and no notes on reproductive behavior can be provided at this time.

## DISCUSSION

Previous work (Childs 1998) suggests that spawning behavior of speckled dace is very similar to that of loach minnow (Childs 2004), given the similarity of egg deposition pattern by each species. However, without direct video of dace exhibiting reproductive

behavior, it is impossible to compare the two species with regard to behavior and spawning cues. It is interesting to note the difference in ability to induce winter spawning between the two species. While loach minnow will spawn during every month of the year when exposed to a continuous April photoperiod, this is obviously not the case with speckled dace. Other spawning cues, such as water temperature changes (Kaya 1991) or flooding (John 1963) are apparently necessary to induce spawning by speckled dace. In addition, two previous studies have shown that speckled dace may not spawn until they have been held in captivity for at least six months (Childs 1998; Kaya 1991). In addition, both of these authors induced reproductive development in speckled dace by exposing fish to a May photoperiod (14 h L: 10 h D). This was not attempted during the present study, nor was temperature in the laboratory changed, because of the presence and spawning activity of loach minnow and spikedace that were already on station.

In order to determine if any males were present during this study, the photoperiod will be changed to a May photoperiod. The effects of this change on loach minnow and spikedace reproduction will be recorded, and development of secondary sexual characteristic, and perhaps spawning behavior by speckled dace, will also be noted. Should more information become available during the summer of 2005 regarding speckled dace spawning behavior, it will be made available via memo or report to Reclamation.

## LITERATURE CITED

Childs, M. R. 1998. Preliminary investigation of induced spawning of native Southwestern minnows: pilot study on speckled dace *Rhinichthys osculus.* Final report prepared by the Arizona Game and Fish Department for the Bureau of Reclamation. Phoenix.

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